Microsoft

Operating System

Introduction to IntelliMirror™

White Paper

Abstract

The IntelliMirror™ management technologies are a set of powerful features built into the Microsoft® Windows 2000 operating system and designed to increase availability and reduce the overall cost of supporting users of Windows. IntelliMirror uses policy-based *Change and Configuration Management* to enable users' data, software, and settings to follow them throughout a distributed computing environment, whether they are on- or off-line.

At the core of IntelliMirror are three features: User Data Management, User Settings Management and Software Installation and Maintenance. These features may be used separately or together. The paper describes how each IntelliMirror feature works and provides examples of their use.

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THIS IS INTELLIMIRROR

The IntelliMirror™ management technologies are a set of powerful features built into the Microsoft® Windows 2000 operating system, designed for desktop *Change and Configuration Management*. IntelliMirror uses features in both Windows 2000 Server and Windows 2000 Professional to allow users' data, software, and settings to follow them.

The features of IntelliMirror increase the availability of a user’s data, personal computer settings, and computing environment by intelligently managing information, settings, and software. Based on policy definitions, IntelliMirror is able to deploy, recover, restore or replace user’s data, software, and personal settings in a Windows 2000–based environment.

Essentially, IntelliMirror provides users with follow-me functionality for their personal computing environment. Users have constant access to all of their information and software, whether or not they are connected to the network, with the assurance that their data is safely maintained and available.

IntelliMirror is an addition to the Zero Administration initiative for Windows (ZAW). IntelliMirror allows an administrator to set policy definitions once and be confident that the policy will be applied without further administrative intervention.

At the core of IntelliMirror are three features:

- User data management;
- Software installation and maintenance;
- User settings management.

IntelliMirror features can be used separately or all together, depending on the business or organizational requirements.

This paper defines and explains IntelliMirror and its features and presents practical applications of IntelliMirror to show the overall benefit achieved by combining these features.

From an organizational point of view, overall cost compared to benefits is of great concern. IntelliMirror features are designed to deliver new benefits, while reducing system administration. The majority of IntelliMirror features are designed to keep users working productively, while enabling centralized administration and thus reducing administrative intervention and associated costs.

The new level of centralized management made possible with IntelliMirror allows organizations to accomplish their change and configuration management goals more easily, since the entire organization can be viewed and altered from the single view of the Active Directory. Both

administrators and users benefit, and the result is lowered computing costs with improved productivity.

In Windows 2000, the features of IntelliMirror can be set up to control and manage:

- **User data:** the files, documents, spreadsheets, workbooks, and other information that users create and use to perform their jobs.
- **Software installation and maintenance:** the installation, configuration, repair, and removal of applications, service packs, and software upgrades.
- **User settings:** the customizations of operating system and applications which define the computing environment of a user, for example, language settings, custom dictionaries, desktop layout, color schemes, and other user preferences.

The table below illustrates the three core features of IntelliMirror and the relationship of IntelliMirror within change and configuration management:

Although most features of IntelliMirror can be applied through Group

Change and Configuration Management		Feature	Benefits	Technologies
	IntelliMirror	User Data Management	**My data and documents follow me!** Users can have access to the data they need to do their jobs, whether online or offline, when they move from one computer to another on the network. Administrators manage this feature centrally by policy to minimize support costs.	• Active Directory™ • Group Policy • Offline folders • Synchronization Manager • Enhancements to the Windows ® shell • Folder Redirection • Disk quotas
		Software Installation and Maintenance	**My software follows me!** Users have the software they need to perform their jobs. Software and optional features install "just in time." Once installed, software is self-repairing. Administrators manage application and OS upgrades as well as application deployment centrally by policy. This minimizes support costs.	• Active Directory • Group Policy • Windows Installer • Add/Remove Programs in the Control Panel • Enhancements to the Windows shell
		User Settings Management	**My preferences follow me!** Users see their preferred desktop arrangements from any computer. A user's personal preferences and settings for desktops or software are available wherever the user logs on. Administrators manage this feature centrally by policy to minimize support costs.	• Active Directory • Group Policy • Offline folders • Roaming user profiles • Enhancements to the Windows Shell
		Remote OS Installation	Administrators can enable remote installation of Windows 2000-based operating systems and desktop images on new or replacement computers with out on-site technical support.	• Active Directory • Group Policy • Dynamic Host Configuration Protocol (DHCP) • Remote Installation Services
	IntelliMirror + Remote OS Installation		Machine Replacement →	

WHAT INTELLIMIRROR MEANS TO THE ORGANIZATION

Policy and the Active Directory these technologies are not necessary for every IntelliMirror feature. Most of the features can be set on the local level or through local polices. Some IntelliMirror functions, such as offline folders, do not even require local policies to be set and only require the Windows 2000 Professional client to have access to a server supporting the Server Message Block (SMB) protocol. This means that an organization's use of IntelliMirror is based on the needs of the organization. When planning to use IntelliMirror, an organization should assess which features of IntelliMirror are needed, and then implement the technology required to meet these needs.

IntelliMirror features are integrated components of the Windows 2000 operating system. For an organization of any size, IntelliMirror leads to a more available, controlled environment.

Role of Group Policy in IntelliMirror

IntelliMirror provides change and configuration management through policy-based management. Policy-based management refers to the use of either local policy or Group Policy to define the settings and capabilities of a user or computer. Local policy is set on a local computer, whereas Group Policy is configured and affects groups of users or computers through the Active Directory. Through use of Group Policy, IntelliMirror can assist in centralizing and simplifying change and configuration management.

Group Policy can be used to apply business requirements and company standards centrally on groups of users and computers. Groups are considered a collection of user and computer objects that are stored in the Active Directory. The ability to centrally manage multiple users and computers dramatically reduces the time and effort that an administrator must devote to management. Once Group Policy is applied, the system maintains that state without further intervention.

Increased Availability of Personal Environment

People use computers in a stand-alone state, as well as in a network-connected state. People also frequently transition between these states in the course of doing their jobs. IntelliMirror makes it possible to get the most out of the personal computer, because data and settings follow the user without regard to which connectivity state they are in. The increased availability of the user's data and personal environment is a result of storing that information on network servers, as well as in synchronized offline locations on the local hard drive. The simplicity of use arises from

the transparency of this feature to the user. User's can log on to any computer and have access to their own data and documents, their own preferences, and their own applications, without having to understand what is happening behind the scenes.

User Data Management

User data can follow the user whether the user is online, connected to the network or offline, in the stand-alone state. The user data follows the user because IntelliMirror can store the data in specified network locations while making it appear local to user.

There are several ways that an administrator can arrange for user data to follow users. These can be set up manually, on a per-user basis, or configured through the use of Group Policy.

A key method is to redirect specific user data folders (like My Documents, or any other folder) to a network location, then set this location to be available for offline use. When a user then saves a file to the My Documents folder, the save is performed to the network and synchronized back to the local computer. This synchronization occurs in the background, transparently to the user.

The user works in the same way, whether on or offline, and is unaffected by temporary network outages. When a user works offline, either through choice, or because of a network failure, all modifications and changes to any user data are made to the local copy. Eventually, when the computer is reconnected to the network, resynchronization with the network copy occurs automatically. If the network copy and the local copy have both changed, the synchronization manager prompts the user as to whether to save both copies or to synchronize against one or the other.

Software Installation and Maintenance

Applications can follow users or computers in the same fashion. This allows the same applications to be available at any computer that a user logs on to. From the user's point of view, there is not necessarily a setup or configuration process when installing software: it is always available and functional, using just-in-time installation and, as necessary, repair of the software.

For applications that have been *assigned* to the user by Group Policy, the user's computer is set up with a Start menu shortcut, and the appropriate file associations are created in the registry. To the user it looks and feels as if the application were already present. However, the application is not fully installed until the user needs or wants the application.

This means that when the user attempts to open the application or a file associated with that application, a background Windows service called the Windows Installer checks to make sure that all the files and

parameters of the application are present for the application to properly execute. If they are not present, the Windows Installer service retrieves and installs them from a predetermined distribution point. Once in place, the application opens.

Unlike previous install mechanisms, for example some traditional Setup.exe files, application installation is efficient because of the way applications are authored to use the Windows Installer service.

Optionally, applications can also be *published* by Group Policy. Applications that are published appear in the Add/Remove Programs in Control Panel. Installation of published applications is at the user's discretion. Installation also occurs when a user or application attempts to open a file that requires a specific published application. This is known as *document invocation*.

Ideally, published applications should be authored to install, using the Windows Installer service; however, Group Policy–based publishing also supports applications written using the traditional Setup.exe installation method.

Application repair follows the same logic as just-in-time installation. Whenever a Windows Installer-authored application is invoked, the Windows Installer service checks to ensure that the appropriate files are available. Repair of missing files and settings is, therefore, automatic, for example, if a user deletes a necessary .dll, or even the associated .exe, file needed to use the application. When the user opens the application, rather then failing, the Windows Installer automatically reinstalls these files from the predetermined distribution point so that the application functions properly.

User Settings Management

User settings, like user data, can follow the user, regardless of where that user logs on because IntelliMirror uses Group Policy and the Active Directory to store all important user settings.

Administrators use *settings* to customize and control users' computing environments and to grant and deny the users the ability to customize their own computing environments. These setting can be applied to users and computers. When users have permission, they often customize the style and default settings of their computing environment to suit their needs and work habits. Settings contain three basic types of information: user and administrative information, temporary information, and data specific to the local computer. For example:

- User settings include items such as IE favorites, quick links, cookies, and the Outlook Express personal Web address book or background bitmap.

- Administrative settings include typical lock-down settings, for example, the hide run command, disallow writes to system folders, and configure user-viewable items in Control Panel.
- Temporary information includes items such as the user's personal Internet Explorer (IE) cache.
- An example of local computer settings would be what folders/files are marked for offline use.

In an environment where users are permitted to use more than one computer, temporary and local computer information typically should not roam with that user. This can cause unnecessary overhead, and differences between computers could disrupt the roaming function.

When IntelliMirror is managing user settings, Group Policy ensures that only vital user and administrative settings information is retained, while temporary and local computer settings are dynamically and appropriately regenerated as required. This minimizes the amount of information that must be stored and transferred across the network, while still allowing users to have a similar experience on any computer that they log on to.

This section gives example scenarios that show some of the practical uses of IntelliMirror.

The scenarios present a snapshot of a user's computer in its various uses and stages throughout a typical life cycle. Each of the scenarios fits into an entire picture or can be seen as a separate event and shows how IntelliMirror benefits the entire organization by reducing the time and effort associated with maintaining the computing environment.

The scenarios presented explore the following events:

- Scenario 1: The New Hire
- Scenario 2: First Logon
- Scenario 3: Taking A Laptop on the Road or Home
- Scenario 4: Returning to the Network with a Laptop
- Scenario 5: Self Repairing Software Applications
- Scenario 6: Computer Replacement

Scenario 1: The New Hire

One of the most critical and time consuming IT tasks is setting up the new hire with a computer. In an organization that is using IntelliMirror, the new hire logs on to a new computer and finds documents and shortcuts already on the desktop. These shortcuts link to common files, URLs and data that are useful to all employees (for example, the employee handbook, a shortcut to the intranet, and a shortcut to the user's departmental guidelines and procedures).

Note: The Windows 2000 Remote OS Installation feature provides

additional value in this scenario. This is covered in the next section, “Extending The IntelliMirror Infrastructure.”

Technology Used: Group Policy

In this example, the user receives a preset desktop that contains documents and shortcuts that are considered essential to the business. The preset desktop was configured before the new hire logged on to the network. This desktop was configured based on business processes that are needed within the organization. Group Policy makes this possible.

Group Policy is a set of objects and rules that define the computer resources available to a given group. Group Policy is not set at the local user or computer level; rather, Group Policy is set based on Active Directory groupings and permissions, including Security Groups. These may define multiple computers and users, ranging from a single computer or user to several million.

Group Policy objects (GPOs) can define the various facets of the desktop environment that an administrator needs to control, such as assigned software, the ability to install additional applications as well as modify the local computer settings.

GPOs are built cumulatively, from the largest grouping (the domain) to the smallest (the individual user or computer). Each subsequent setting overrides the previous setting, and each setting level is more granular than that which precedes it. Not all Group Policy settings have such obvious effects on the user’s experience. Many of the policies that can be applied enable locking down or controlling what a user can do on a computer. A user does not notice such policy being applied or even know that it has been applied.

In the above scenario, at log on, an association is made between the user and a server-side policy. At this time, data and information is immediately delivered to the computer without an administrator having to touch the computer. In this case, the desktop was preset by redirecting the desktop folder to location on the network. This allows information and settings to be established automatically and for multiple users, based on a single administrative setting in Group Policy. In this scenario, the desktop is already populated with items that a new hire would require. When the new hire logs on, the items on the desktop are copied to the local desktop directory as part of the desktop. This means that the user now has the items local and can use them without placing any burden on the network. Moreover, as the user begins to customize the desktop settings and items, the user’s desktop is stored in a predetermined location on the network, and these settings are saved as the user’s desktop. Essentially, by redirecting the desktop, the administrator allows the user to be presented with exactly the business

information required, when needed.

Scenario 2: First Logon

The new hire logs on for the first time and notices that software, such as Microsoft Word, is already present in the Start menu. When the user selects Word from the Start menu, it automatically installs. If the user double-clicks the employee handbook to open it, Word is installed automatically, and the employee handbook appears on the user's screen.

Technology Used: Group Policy and Windows Installer

Software installation and maintenance, managed through Group Policy, and the Windows Installer service are the enabling technologies in this scenario. Based on the user's Active Directory membership and the Group Policy applied based on the user's location in the Active Directory, the user was assigned Word as one the applications related to the user's position.

When the user logs on, the resulting set of policies from all their Active Directory memberships is applied. When a user invokes an application or opens a document, the Windows Installer service does the rest of the work. In this way, IntelliMirror ensures that the necessary and correct items assigned to a user's appear in the Start menu.

Using Group Policy the administrator can *assign* or *publish* differently configured versions of the same application to different collections of users. When an application is invoked, the Windows Installer service installs or repairs the application. It does this by referencing its internal database for all necessary information about how the application is installed, where a source of the application is found, and how the application is to be configured.

IntelliMirror uses the Windows Installer service to provide just-in-time software distribution to client computers. When the user launches Word or opens the employee handbook for the first time, the Windows Installer service checks to see if the application is installed on the local computer. If it is not, the Windows Installer downloads and installs the necessary files for Word to run and to sets up the necessary local user and computer settings. Although Windows Installer continues to check each time the application is invoked, it does not attempt to reinstall or repair the application unless necessary files are found to be missing.

IntelliMirror can also uninstall, refresh, update, and upgrade software. In uninstalling software, all parts are correctly removed; in refreshing, new items and updates are applied to the already installed applications; in upgrading applications, the specified application is removed, and the new application is installed to the user's computer. This provides the capability to manage the full working life-cycle of software.

Scenario 3: Taking A Laptop on the Road or Home

A laptop user working at the office creates a number documents and saves them to My Documents. After saving documents to My Documents, the user then logs off, unplugs from the network, and takes the laptop home. While at home and off the network, the user continues to edit the documents saved earlier in My Documents

Technology Used: Group Policy and Offline Folders

In this scenario, the documents are actually saved to a network location in a process that is transparent to the user, and then saved in the My Documents directory back on the user's local computer. This done without any perception of performance degradation. All of these actions were done by redirecting the My Documents folder to a network location.

Immediately after the user saves the document to the network folder, the document is saved to the local My Documents folder transparently. This action takes place, because the network folder is setup to be available offline. This configuration creates a copy of the network folder's contents into the My Documents folder on the local computer. In this manner, IntelliMirror allows the user to access the data when offline.

Redirecting folders has many benefits, including centralized backup and management of user data, access to user data by roaming users from any computer on the network, and protection of data from failure (or loss) of a user's computer.

Scenario 4: Returning to the Network With a Laptop

The laptop user in Scenario 3 returns to the office and logs on to the network. Since the user has done some offline work, a dialog box appears advising the user that data in My Documents has changed and is being synchronized with the network copy.

Technology Used: User Data Settings

As soon as the user reconnects to the network, IntelliMirror attempts to reconnect to the network location of the redirected folders. When IntelliMirror reconnects, it checks if there are differences in the data between the local copy of the folder and the network copy. In this scenario, the user has made modifications to a document on the local computer. IntelliMirror identifies this change and updates the version held on the network.

IntelliMirror is not intended to be the basis of a multiuser collaboration tool; however, IntelliMirror can support the case in which both the offline and networked copy of a user data file are modified. If this occurs, perhaps because a colleague updates the networked copy while the user is offline, IntelliMirror prompts the user about the conflict. In this case, resolution is manual. The user is asked if both copies should be kept or

which of the two versions should be overwritten. If both are to be kept, the user is asked for a new file name to store one of the versions so that uniqueness is maintained.

Scenario 5: Self Repairing Software

A user decides to explore the computer and tries to get rid of unnecessary files. The user deletes .dlls, help files, and other files that are crucial to Microsoft Office. Later, when the user opens a document in Word, rather than failing, Office automatically repairs itself and works normally.

Technology Used: Group Policy and Windows Installer

The Windows Installer service provides much more than the capability to install applications. This technology also protects the integrity of the application against inadvertent mishaps with the local files. In this scenario, when the user attempted to open Word, the Windows Installer service identifies that some essential files were missing. The missing files are immediately reinstalled from the network source specified to the Windows Installer when the application was first installed. The user briefly sees a dialog box with a progress bar, and then Word opened as if nothing were wrong.

Research shows that a fair amount of user down time is caused by inadvertent configuration changes to the local computer. In a conventional environment, the user is often down for some time while the problem is diagnosed, a technician dispatched, and software completely reinstalled. In this scenario, neither the support desk nor the user's time is wasted on a support call because the Windows Installer repairs the software automatically and with minimal file copies.

Scenario 6: Replacement of a Computer

The computer that the user is working on suddenly stops working with a complete hardware failure. This is every IT department's nightmare. The user calls the support line, and about 20 minutes later a new computer, loaded only with the Windows 2000 Professional operating system arrives for the user. Without waiting for technical assistance, the user plugs in the new computer, connects it to the network, and boots it. The computer allows the user to log on to the corporate network, and the user finds that the desktop has taken on the same look and feel as the original computer that it replaced. It has same color scheme, the user's preferred background picture is on the screensaver, and all the application icons, shortcuts, favorites are present. Even more importantly, all the user's data files have been restored.

Technology Used: IntelliMirror Infrastructure

In a disaster recovery scenario, IntelliMirror assists in getting the user back up and running in the shortest possible time and with the minimum

of support. The features of IntelliMirror allow the user and the user's data and settings to be independent of any specific computer.

The entire configuration is set up through Group Policy. Group Policy settings follow the user and are applied wherever the user logs on to the network. This gives the appearance of the data following the user because the data location is configured through Group Policy. This means that wherever the user logs on, the retrieval of the contents appears to be available from the local computer.

In this scenario, the solution is not limited to getting the user a new computer. The user could have also moved to another workstation since all of the data, settings, and environment are mirrored on the network. The features of IntelliMirror can be used separately or combined to address the range of needs, from minor configuration changes and updates to complete disaster recovery. Together, they greatly increase the availability of the desktop and reduce overall TCO.

This scenario is only covering IntelliMirror features; therefore, in this case the support department shipped a computer pre-loaded with Windows 2000 Professional. However by making use of Windows 2000 Remote OS Installation, it would also be possible to send out computer hardware in any state. Without pre-loading and configuring the correct operating system, Remote OS Installation can install Windows 2000 Professional once the computer is on site. This is covered in more detail in the next section.

Remote OS Installation and Microsoft Systems Management Server

Together or separately, Remote OS Installation and Microsoft Systems Management Server (SMS) deliver greater manageability of user desktops, using core Windows 2000 management features and services.

Adding the Windows 2000 Remote OS Installation Feature

This feature can be used to install Windows 2000 Professional on a new computer or to rebuild a computer as part of a disaster recovery. The automatic remote installation of an operating system is performed through the Remote OS Installation feature of Windows 2000 Server.

In either scenario, the computer requests a service boot during its startup sequence. Typically, this is a manual operation requested by the user. Computers conforming to the PC98 hardware specification (including those that meet Intel's Wired for Management Baseline Specification 2.0)

support this function through a specific key sequence or function key during startup. For older computers that do not support this function but that do support a PCI bus, Microsoft provides a bootable floppy disk containing the necessary preboot software for a range of network interface cards. If a service boot is requested, the computer establishes a network connection and makes a request for any nearby Windows 2000 Server to host the service boot request.

Once this initial boot sequence and connection with a Windows 2000 Server is established, the user is requested to log on. This information is verified by the Windows 2000 Server against the Active Directory. If correct, the Windows 2000 Remote Installation Services then uses Group Policy to identify what configuration of Windows 2000 Professional the user is required to install. If the user is permitted more than one configuration (for example a user may be assigned a different configuration for a laptop and for a desktop), the user is presented with a list of available operating system configuration options. The user selects the configuration of choice and waits while the system automatically loads the appropriate configured version of Windows 2000 Professional.

As can be seen, the new Windows 2000 Remote OS Installation feature significantly reduces the amount of labor required to deploy a computer. For example, in a conventional disaster-recovery scenario, an administrator would receive a new computer, manually install and configure the operating system, install applications and configure the network and personal settings for each user. Using Remote OS Installation, the entire process is policy-based and automatic. It can be accomplished without prestaging and without the need for on-site technical support.

Adding Systems Management Server Desktop Management

Systems Management Server 2.0 provides scalable change and configuration management of Windows-based personal computers in an enterprise. Based on the native management services infrastructure provided by Windows management services, Systems Management Server 2.0 allows regional and central desktop management support personnel to work together, using an integrated set of tools that provide planning, deployment, and diagnostic tools. Systems Management Server can be used to complement the built-in features of IntelliMirror and Remote OS Installation, as well as being used in pre-Windows 2000 environments. Systems Management Server supports all Windows 16-bit and 32-bit desktops, from Windows 3.1 to Windows 2000, whether operating in a Microsoft Windows NT®, NetWare 3.1, or NetWare NDS environment. The following table assists in determining when to use the IntelliMirror feature set or the Systems Management Server feature set:

	SMS	IntelliMirror	Both
Distribution	Yes	No	Yes
Targeting	Collection	Active Directory	Collection or Group
Platform	All Platforms	Windows 2000 only	All
Installation	SMS or Windows Installer	Windows Installer	All
Additional management support	Yes	No	Yes

As a stand-alone desktop management system or as the desktop management component within an integrated enterprise management solution, Systems Management Server 2.0 includes the following facilities:

- **Hardware and software inventory—**Systems Management Server uses Windows Management Instrumentation (WMI)[1] and software scanners to upload detailed hardware and software inventory information into a SQL Server™–based repository. This provides administrators with a dynamic, efficient mechanism for obtaining a comprehensive audit of all hardware and software on every computer. Additionally, a new compliance comparative database tool has been added, which can evaluate inventory after it is collected and generate reports on compliance status. This is especially useful for identifying Year 2000 applications.
- **Software distribution and installation—**Using Systems Management Server 2.0, administrators can deploy applications to computers, users, and user groups. Software distribution is now rules-based, and distribution targets are dynamically evaluated. It is also fully integrated with inventory to allow sophisticated targeting. Systems Management Server 2.0 first performs a query of software inventory and collection information. It targets an audience, and then deploys software to that audience, according to administrator-defined rules.
- With Systems Management Server 2.0, administrators can distribute an application immediately if a situation requires it, and they can roll back applications—this includes the ability to uninstall software automatically when a user moves to a different department.

[1] The Windows Management Instrumentation (WMI) technology is compatible with the Desktop Management Task Force's (DMTF) Web-Based Enterprise Management (WBEM) initiative. It takes advantage of the DMTF Common Information Model (CIM) to represent managed objects in Windows-based environments.

- **Software metering**—Administrators often require tools to track software usage by users, groups, workstations, time, or license quota. Systems Management Server 2.0 can monitor, analyze, and if required, control the use of applications on servers and workstations. These tools provide administrators varying levels of control, ranging from simple alerts to the ability to prevent applications from running.
- **Diagnostics and troubleshooting**—In addition to reporting on the current state of a workstation or server and providing remote control facilities, Systems Management Server also provides a range of advanced diagnostic tools. These include tools such as a network monitor with real time and post-capture experts to analyze network conditions and performance, and a server HealthMon tool, which can track critical performance information on Windows NT Server and Microsoft BackOffice®.

The IntelliMirror features can be used in small, medium, and large organizations. Used alone or in combination with other change and configuration management tools, IntelliMirror can dramatically lower the cost of the desktop life cycle. For example:

- Costs associated with change and configuration management are reduced through use of Group Policy because Group Policy allows management control over groups of computers and users through single settings.
- Smart technologies included in the Windows Installer service allow installation, repair, updating, and removal of applications to occur when needed and wanted. This reduces the support burden and increases availability of the user’s computer.
- User data becomes more available. Because data can be automatically stored in locations that follow the user, as well as be highly resistant to failure, the cost associated with managing user data is significantly decreased.
- Extending IntelliMirror with Remote Installation Service and Systems Management Server 2.0 further reduces the cost of managing the desktop through features such as inventory management and advanced software distribution.

Used together or individually, the IntelliMirror features are closely integrated with both the operating system and each other, providing ease of use and configuration for the administrator, while extending better service to users. Therefore, the overall state and cost of distributed computing can be controlled and reduced from centrally by a trained administrator.

FOR MORE INFORMATION

For the latest information on Windows NT Server, visit the Web site at http://www.microsoft.com/ntserver the Windows NT Server Forum on the Microsoft Network (GO WORD: MSNTS).

Management and Overview Papers

The following table lists papers that introduce the Microsoft Windows management services and change and configuration management. These papers are intended for managers and technical decision makers who need to understand the business requirements for, and the benefits of, management features, as well as the Microsoft management architecture, tools, and solutions. It is recommended that you read these in the order listed below.

Title	Content	Point your browser to:
Introduction to Windows Management Services	An overview of the management roles and disciplines, as well as the architecture for management solutions that is available either as part of the operating system or as an add-on.	http://www.microsoft.com/ntserver/management.
Introduction to Change and Configuration Management	An overview of change and configuration management and an introduction to how Microsoft products, such as Windows 2000 IntelliMirror, Remote OS Installation and Systems Management Server address this management discipline.	http://www.microsoft.com/ntserver/management.
Remote OS Installation	An overview of the features of Remote OS Installation and scenarios illustrating how organizations can benefit from IntelliMirror.	http://www.microsoft.com/ntserver/management.
Systems Management Server	An overview of the features of Systems Management Server, and discussion of its benefits.	http://www.microsoft.com/ntserver/management and http://www.microsoft.com/smsmgmt.
Windows 2000 Group Policy	Xxx	http://www.microsoft.com/ntserver/

		management
Windows 2000 Software Installation and Maintenance	Xxx	http://www.microsoft.com/ntserver/management
Windows Installer Service	Xxx	http://www.microsoft.com/ntserver/management